

# **Final Status Survey Report Survey Unit P1-Z1-2A (Northern Construction Support Zone)**

**August 1, 2017**

Revision 0

**Prepared For:**

U.S. Environmental Protection Agency  
Region 10  
1200 Sixth Avenue  
Seattle, Washington 98101

**Prepared on Behalf of:**

Newmont USA, Limited and  
Dawn Mining Company

**Prepared By:**

Worthington Miller Environmental, LLC  
1027 W. Horsetooth Rd., Ste. 200  
Fort Collins, Colorado 80526

## TABLE OF CONTENTS

1.0	INTRODUCTION .....	1
2.0	METHODS.....	1
2.1	Bedrock Verification .....	1
2.2	Gamma Radiation Survey .....	2
2.2.1	Gamma Survey Results.....	2
3.0	FINAL STATUS SURVEY COMPLIANCE EVALUATION CRITERIA.....	3
4.0	SUMMARY OF COMPARISONS WITH COMPLIANCE EVALUATION .....	3
5.0	QUALITY ASSURANCE / QUALITY CONTROL .....	5
6.0	CONCLUSIONS .....	6
7.0	REFERENCES .....	7

## LIST OF TABLES

TABLE 1.	DATA EVALUATION MATRIX FOR FSS OF CLASS 1 SURVEY UNIT P1-Z1-2A (NORTHERN CSZ).....	4
----------	--	---

## LIST OF FIGURES

FIGURE 1.	MAP OF THE LOCATION OF CLASS 1 SURVEY UNIT P1-Z1-2A (NORTHERN CONSTRUCTION SUPPORT ZONE) AT THE MIDNITE MINE SUPERFUND SITE.
FIGURE 2.	FINAL STATUS GAMMA SURVEY RESULTS FOR EXPOSED BEDROCK ACROSS SURVEY UNIT P1-Z1-2A (NORTHERN CSZ)
FIGURE 3.	QUALITY CONTROL CHARTS APPLICABLE TO THE INSTRUMENTATION USED FOR THE FINAL STATUS GAMMA SURVEY OF UNIT P1-Z1-2A
FIGURE 4.	GAMMA SCAN COVERAGE MAP OF SURVEY UNIT P1-Z1-2A, WITH EACH MEASUREMENT SYMBOL SIZED AT APPROXIMATELY 3-METERS DIAMETER BASED ON A FISHNET TRANSECT GRID OVERLAY OF EXACTLY 3-METER SPACING

## LIST OF ATTACHMENTS

**Attachment 1 Documentation/Verification of Competent Bedrock (Phase 1)**

**Attachment 2 Documentation/Verification of Competent Bedrock (Phase 2)**

**Attachment 3 Field Logbook Notes**

**Attachment 4 Calibration Certification for Gamma Survey Instruments**

## 1.0 INTRODUCTION

A Final Status Survey (FSS) was completed at the Midnite Mine Superfund Site (Site) across Survey Unit P1-Z1-2A within the Northern Construction Support Zone (NCSZ) (Figure 1). The FSS consisted of two components; 1) confirmation that all excavation in the area has been completed to bedrock and 2) completion of a gamma radiation survey (gamma survey) of the excavated area. There were no deviations from the FSS Work Plan (ERG, 2017).

All remedial action construction activities were completed in the NCSZ including demolition of Man Camp buildings, excavation/removal of trash pits, petroleum-contaminated soil piles (PCS), and excavation of all remaining soils to bedrock.

## 2.0 METHODS

### 2.1 Bedrock Verification

Excavation of soils in the NCSZ occurred in two phases as discussed in the FSS Work Plan. Initially, excavation of stockpiled materials and soil in the NCSZ occurred in all areas except where buildings (Mancamp area) and trash pits/PCS soils were encountered. This initial excavation was conducted in the fall of 2016. Remaining soils were removed in the NCSZ following removal of the buildings and trash pits in 2017. As stated in the FSS Work Plan, "In all excavated areas, soil excavations proceeded to bedrock because the gamma cutoff level could not be achieved. This outcome has been determined to be attributable to underlying native porphyritic quartz monzonite (QM) geology."

An evaluation of the area initially excavated in 2016 was conducted on November 9, 2016 to confirm excavation to bedrock in accordance with Appendix S of the Remedial Action Work Plan (RAWP)(Attachment S-3)(MWH, 2016). The results of this determination were included in the FSS Work Plan and are included in Attachment 1 of this Report for completeness.

Trash pit areas and the Man Camp area was excavated to bedrock in 2017 and verification of excavation to bedrock was confirmed on July 19, 2017 and documented in an inspection report dated July 25, 2017 which is included as Attachment 2.

As demonstrated by the field verification, all areas in the NCSZ have been excavated to bedrock.



## 2.2 Gamma Radiation Survey

Final status gamma survey data were collected by Tetra Tech, Inc. personnel in a 2-day field event (July 19-20, 2017) at the direction of the analytical Field Program Director<sup>1</sup> for Remedial Action at the Site.

The gamma survey involved walkover scanning across all safely accessible portions of Survey Unit P1-Z1-2A. The Field Program Director was consulted prior to the field work to provide advising and oversight with respect to implementation of the methods and data quality assurance requirements specified in the FSS Work Plan (ERG, 2017). Conditions in the field were favorable for gamma surveys as described in AS-SOP 6 and as documented in the field logbook (Attachment 3).

The gamma survey was conducted in accordance with the methods specified in the FSS Work Plan (ERG, 2017) and Standard Operating Procedure (SOP) AS-SOP 6 as provided in the Quality Assurance Project Plan (QAPP) [Attachment S-2 to Appendix S of the RAWP (MWH, 2016)]. Details of the methods used are presented in the FSS Work Plan for the Northern CSZ (ERG, 2017) and are incorporated by reference in this FSS Report.

### 2.2.1 Gamma Survey Results

Gamma survey results are shown in Figure 1, along with statistical information. As there are no compliance requirements for gamma survey measurements across areas excavated to bedrock, no evaluation of the gamma survey data is necessary.

Data quality control (QC) measurements taken the day of each survey fell within acceptable QC limits, which, in conjunction with calibration data, demonstrate that gamma survey results are of acceptable quality to complete the documentation requirement (Section 6 and Attachment 3). Data on gamma survey coverage is discussed in Section 6. Gamma survey data were saved electronically with “CSZ bedrock” in the file name, and the data are archived at Worthington-Miller Environmental offices in Fort Collins, CO.

---

<sup>1</sup> Randy Whicker, Environmental Restoration Group, Inc. (ERG)

### 3.0 FINAL STATUS SURVEY COMPLIANCE EVALUATION CRITERIA

As specified in the NCSZ FSS Work Plan, the applicable element of FSS Compliance Evaluation Criteria for the area is confirmation that excavation has occurred to bedrock and that a gamma radiation survey be conducted of the area. As discussed above, both of these elements have been accomplished.

### 4.0 SUMMARY OF COMPARISONS WITH COMPLIANCE EVALUATION

A summary table to formalize compliance with FSS requirements for the NCSZ relative to the applicable Compliance Evaluation Criteria specified in Appendix S (Criterion 6) is provided in Table 1.

**Table 1. Data Evaluation Matrix for FSS of Class 1 Survey Unit P1-Z1-2A (Northern CSZ)**

No.	Compliance Evaluation Criterion for FSS [Appendix S, Section 4.2 (MWH, 2015 and 2016)]	Data Collected	Number of Samples or Coverage for the FSS Unit	Constituent	Gamma Cutoff Level <sup>1</sup>	ROD Clean up Level <sup>3</sup>	ROD Cleanup Level Times Two <sup>4</sup>	Question	Answer	Conclusion
6	Exposed bedrock will not be evaluated in a context of compliance with ROD cleanup levels, but gamma scans must be conducted to document gamma readings.	Field Gamma Survey in $\mu\text{R/hr}$	100% gamma scan areal coverage	NA	None <sup>2</sup>	NA	NA	Has a separate gamma scan survey been performed over the exposed areas of bedrock and saved as a separate gamma scan file?  Have areas of exposed bedrock been delineated and documented consistent with Attachment S-3 of Appendix S?	Y	Compliance Evaluation Criterion Met
Compliance Evaluation Criterion 6 is Met for Exposed Bedrock									Y	Exposed Bedrock in Survey Unit has been documented consistent with Appendix S, Attachment 3. No further excavation required.

NA = Not Applicable

1. Gamma cutoff level from *Report: Gamma Radiation/Radium-226 Correlation and Gamma Cutoff Levels for Remedial Action*. Revision 1. September 2, 2016. ERG for Dawn Mining Company.

2. As indicated in Appendix S (Section 4.2.3.1), the gamma cutoff level does not apply in areas excavated to bedrock that exceeds the gamma cutoff due to natural geologic characteristics.

3. U.S. Environmental Protection Agency (EPA). 2006. Midnite Mine Superfund Site, Spokane Indian Reservation, Washington, Record of Decision. Office of Environmental Cleanup. EPA Region 10. September.

4. Appendix S (4.2.3)

## 5.0 QUALITY ASSURANCE / QUALITY CONTROL

Quality assurance (QA) includes qualitative aspects of program planning and operational management that are necessary to ensure an appropriate overall analytical design and proper implementation of planned methods and procedures. Quality control (QC) includes quantitative measures to monitor analytical method performance and to allow respective estimation of data uncertainty (accuracy and precision). The FSS of the NCSZ included the following QA/QC program elements as specified in the FSS Work Plan (ERG, 2017) and the QAPP for Appendix S (Attachment S-2) of the RAWP (MWH, 2016):

### Final Status Survey QA Summary:

- The gamma survey was subject to the data QA/QC program outlined in the FSS Work Plan and the QAPP, and the organizational structure defined therein was observed for FSS implementation.
- The applicable standard operating procedure provided in the QAPP [AS-SOP 6 (Gamma surveys)] was followed.
- All personnel involved in the oversight, management and implementation of the FSS were qualified by education, training and experience to perform these functions.
- The Data Quality Objective (DQO) process was used to develop the analytical approaches necessary to produce environmental data of the type, quantity and quality necessary to reliably support correct decisions regarding compliance with Compliance Evaluation Criteria. DQO statements are provided in the QAPP.
- The radioanalytical approaches and methodologies used for the FSS are consistent with relevant regulatory guidance (e.g. MARSSIM) and their effectiveness is supported by published results in peer-reviewed scientific journals.
- Detailed notes were kept in a field logbook to document daily activities and any relevant observations regarding environmental or equipment related conditions that could affect FSS data.
- FSS data were reviewed and verified/validated by qualified personnel as defined in the QAPP, including the Field Program Director (Randy Whicker, ERG) prior to data analysis and inclusion of results in this FSS Report.

### Final Status Survey QC Summary:

- Gamma survey instrumentation used for the FSS (Ludlum Model 44-10 NaI-based scintillometer, coupled with a Ludlum Model 2350-1 ratemeter) was calibrated by the manufacturer within one year prior to use for the FSS of Survey Unit P1-R1. Calibration results were within  $\pm 6.5\%$  or less of known exposure rate reference readings from a Cs-137 calibration source (the manufacturer's tolerance limit for acceptable response is  $\pm 10\%$ ). Applicable calibration certificates are provided in Attachment 4.

- QC measurements were performed for gamma survey instrumentation to verify proper function and help quantify measurement precision and data reproducibility. New instrument QC limits for static background, a Cs-137 check source, and along a background field strip were established by Tetra Tech prior to initiating the gamma survey (on July 19, 2017) within or just outside the Radiation Safety office of the Health & Safety trailer at the Site. Instrument response to each of these QC measurement parameters for the detector/ratemeter pairings used for the FSS gamma scans (MFG-12 and MFG-15) were within acceptable control limits on the day of each survey (Figure 3).

In summary, the QA/QC protocols required by the QAPP for Appendix S were followed, and respective QC metrics indicate that the data are of acceptable quality to meet the DQO's specified in the QAPP for Appendix S.

In addition to conventional QA/QC documentation as provided above, final status gamma survey coverage was evaluated as indicated in the FSS Work Plan for Survey Unit P1-Z1-2A (ERG, 2017). Figure 4 shows the FSS gamma scan data, with the symbol size for each data point set at approximately 3-meter (m) diameter. A 3-m spacing grid overlay is provided in the figure to aid with review of coverage. The only significant areas where the target coverage of 100% (a maximum of 3-m spacing between adjacent measurements) was not achieved are locations where steep terrain, pools of standing water or other obstacles were encountered by field personnel preventing attainment of the target coverage. Based on the data shown in Figure 4, it is qualitatively estimated that 100% coverage was achieved across at least 98% of Survey Unit P1-Z1-2A.

## 6.0 CONCLUSIONS

As documented in this report, the FSS of Survey Unit P1-Z1-2A (NCSZ) provides the required documentation that demonstrates that excavation has occurred in all areas to bedrock. Additionally, the required gamma survey of the excavated area has been conducted in accordance with Appendix S of the RA Work Plan (MWH, 2016) and the FSS Work Plan for this Survey Unit (ERG, 2017). The QA/QC protocols required by the QAPP for Appendix S were followed, and respective QC metrics demonstrate that the data are of acceptable quality to meet the DQO's specified in the QAPP. Upon EPA approval of this FSS report, the NCSZ will be considered remediated to required cleanup levels. The Temporary Stabilization Plan will be implemented and storm water will be allowed to leave the site in accordance with the Storm Water Management Plan. Final regrading of the area will be conducted following determination of the land use plans for the area.

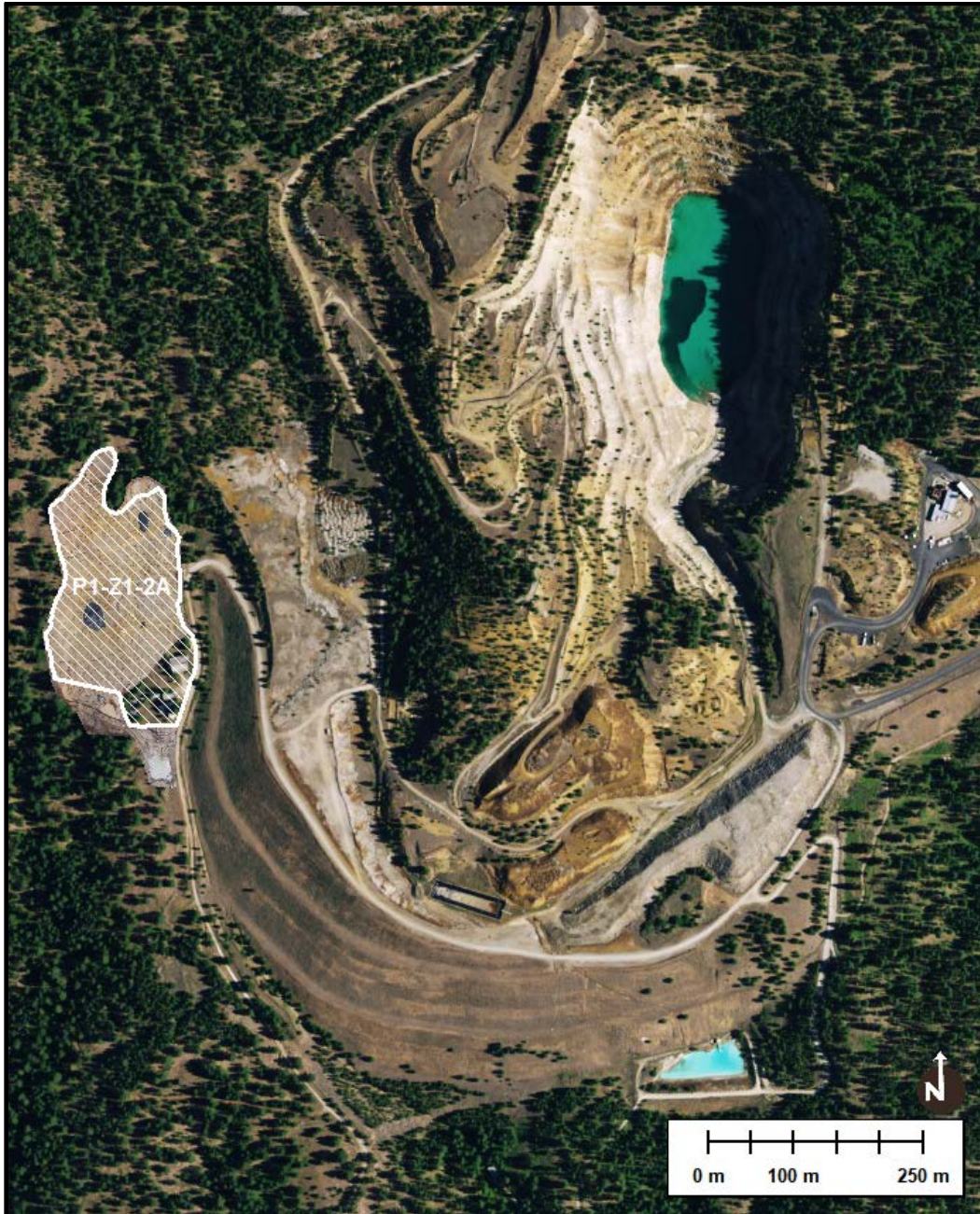
## 7.0 REFERENCES

- Environmental Restoration Group, Inc. (ERG). 2016. Gamma Radiation / Radium-226 Correlation and Gamma Cutoff Levels for Remedial Action. Midnite Mine, Stevens County, WA. Revision 1. September 2, 2016.
- Environmental Restoration Group, Inc. (ERG). 2017. Final Status Survey Work Plan, Survey Unit P1-Z1-2A (Northern Construction Support Zone). Midnite Mine Superfund Site, Stevens County, WA. Revision 2. January 12, 2017.
- MWH Americas, Inc. (MWH). 2015. Midnite Mine Superfund Site 100 Percent Design Basis of Design Report. Revised October 2015.
- MWH Americas, Inc. (MWH). 2016. Midnite Mine Superfund Site Remedial Action Work Plan. Revision 4. April 2016.

## Figures

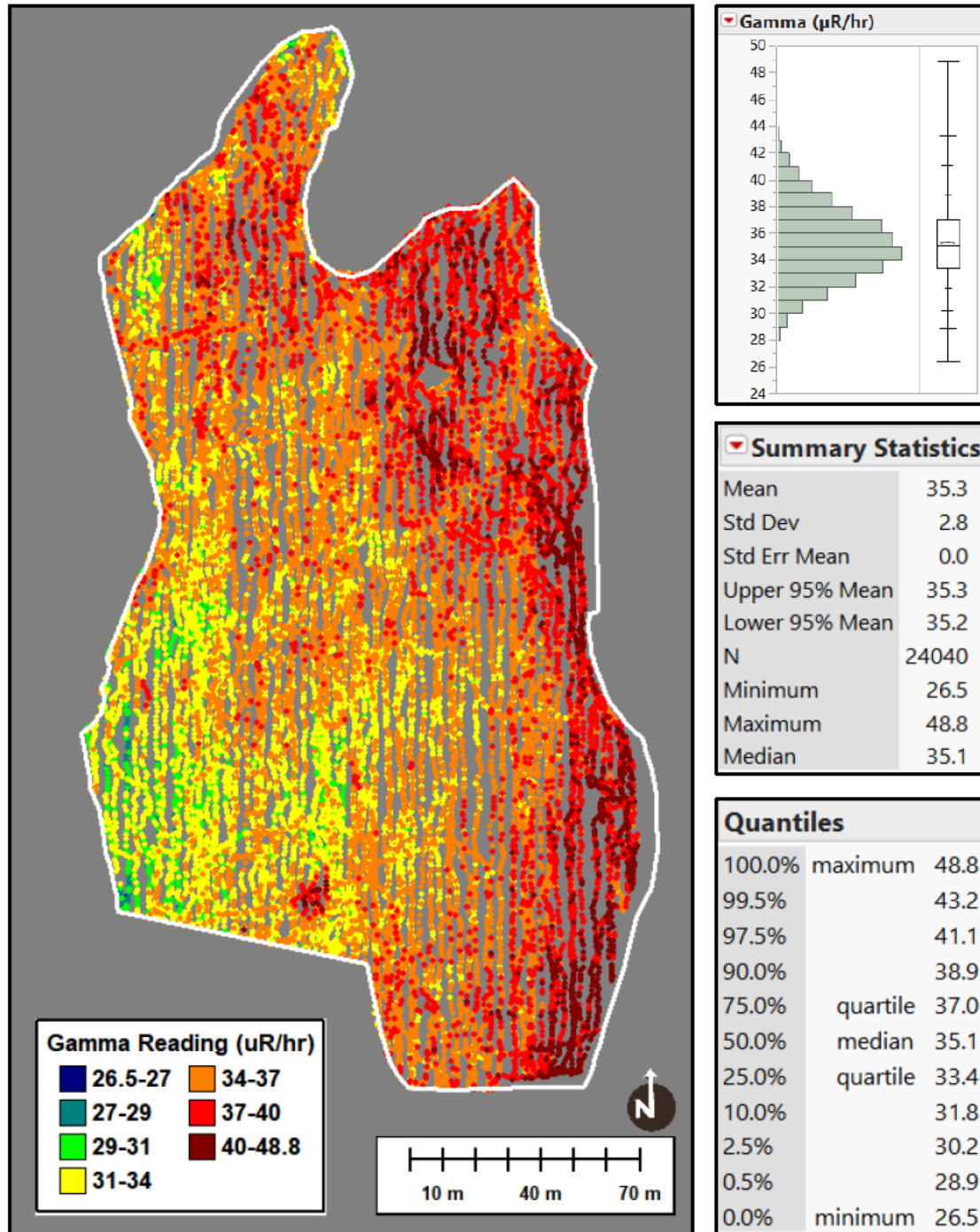
---



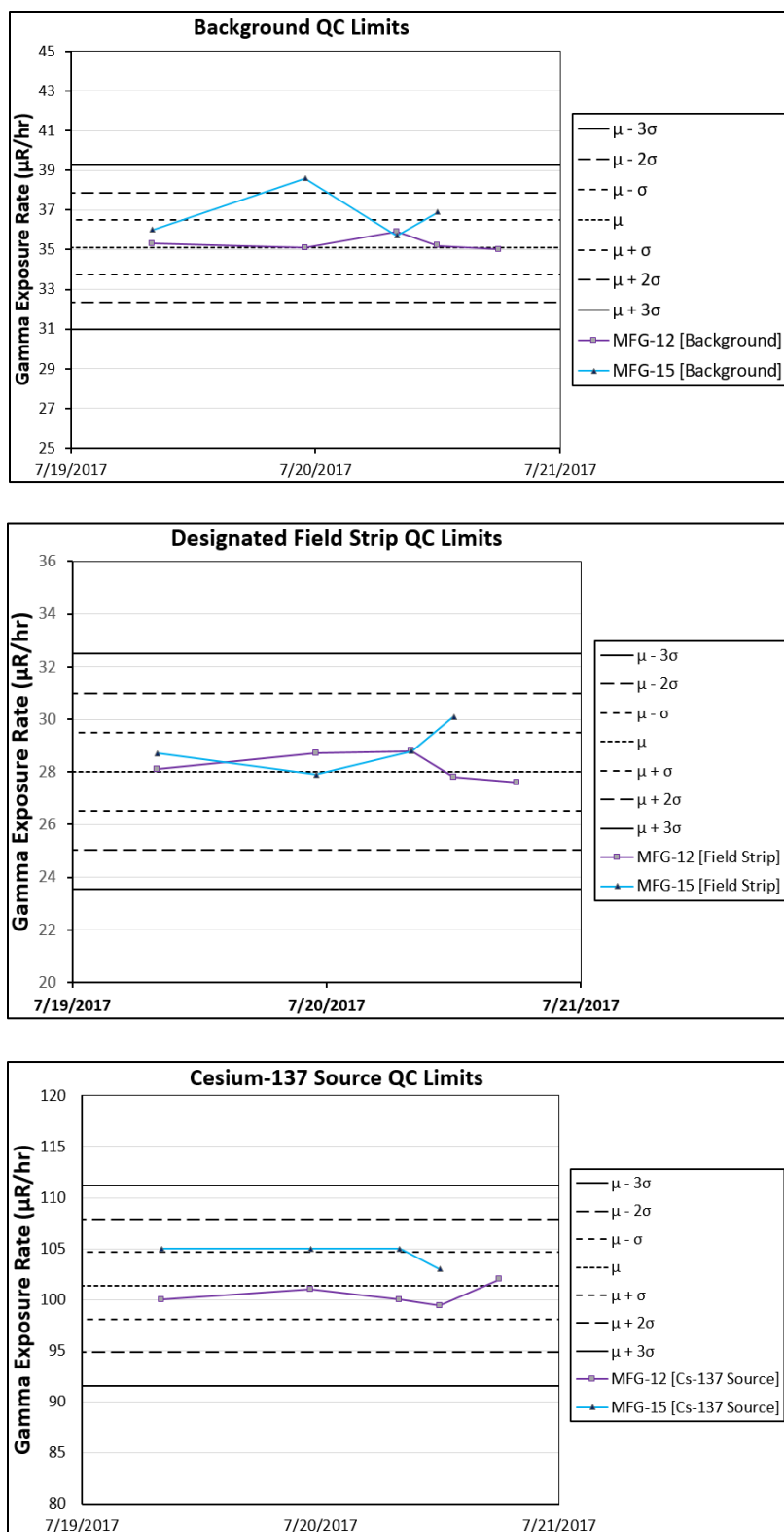


**Figure 1. Map of the Location of Class 1 Survey Unit P1-Z1-2A (Northern Construction Support Zone) at the Midnite Mine Superfund Site.**





**Figure 2. Final Status Gamma Survey Results for Exposed Bedrock across Survey Unit P1-Z1-2A (Northern CSZ)**



**Figure 3. Quality Control Charts Applicable to the Instrumentation Used for the Final Status Gamma Survey of Unit P1-Z1-2A**



**Figure 4. Gamma Scan Coverage Map of Survey Unit P1-Z1-2A, with each Measurement Symbol Sized at Approximately 3-Meters Diameter Based on a Fishnet Transect Grid Overlay of Exactly 3-Meter Spacing**

# **Attachment 1**

## **Documentation/Verification of Competent Bedrock (Phase 1)**

---

(as presented in the FSS Work Plan)

## Observation and Acceptance of Bedrock Refusal

PREPARED FOR: Dawn Mining Company  
PREPARED BY: Terrence Price (MWH CQA Supervisor)  
INSPECTION DATE: 11/09/2016  
REPORT DATE: 11/09/2016  
AREA NUMBER: Northern Construction Support Zone

### Purpose

This memorandum documents observation and stakeholder acceptance of bedrock refusal during a Site inspection of the Northern Construction Support Zone (CSZ) on November 9<sup>th</sup>, 2016. . This observation and acceptance was performed following the recommendations provided in the Analytical Support and Verification Plan for Remediation of Surface *Materials and Sediments*, Appendix S of the *Midnite Mine Remedial Action Work Plan (RAWP)*. Specifically, Attachment S-3 of Appendix S of the RAWP states that:

1. The current standard of construction practice, where the occurrence of bedrock is determined by direct observation of the excavation in progress be used during soil cleanup at the Site. It will be the responsibility of the RA Construction Contractor to notify the supervising Engineer and obtain concurrence that bedrock has been reached prior to terminating soil cleanup excavations.
2. In the event a disagreement occurs between the stakeholders (Contractor, Owner, Engineer, Agencies, etc.) over whether bedrock has been reached at a specific location, that observation of field performance of the specified excavation equipment be used to determine the occurrence of bedrock. Specifically, it is recommended that in the event of a dispute over whether bedrock has been reached, direct observation of excavator “bucket refusal” will be taken as an indication that bedrock has been reached, and the excavation will be terminated. The point of “bucket refusal” will be defined as the depth where the teeth on the bucket (Caterpillar K-Series Extra Duty Teeth on a 30-inch wide bucket) of a track-mounted Caterpillar 320 or similar hydraulic excavator cannot fully penetrate into the formation when the leading end (closest to the bucket) of the tracks have been lifted off the ground. “Bucket refusal” on boulders will not be taken as an indication that bedrock has been reached.

## Bedrock Exposure Delineation/Staking Data

Delineation of the boundary of bedrock exposed by excavation in the Northern CSZ is shown in Figure 1. To facilitate field observations the Northern CSZ bedrock surface was further delineated into five sub-units CSZBR -01 through -05. This boundary and subunit information can be found in:

Northern CSZ Aerial Image Dated:

November 7th, 2016

## Stakeholder Observations of Bedrock

Observation of bedrock encountered at the Northern CSZ was performed by Mr. Steve Demus (CH2M Hill - CQA representative for the USEPA), Mr. Chamil Baigildin (Newmont/DMC Construction Manager), Mr. Terrance Price (MWH CQA Supervisor), and Matt Scott (Envirocon Site Superintendent).

Based on observations made during this inspection and during previous observations of excavation progress during routine On-going CQA inspections, all parties were in general agreement that bedrock had been reached within subunits CSZ-01 through -04. However, because of stormwater retention efforts (i.e., ponded water and sediment deposition) in subunit CSZBR-05, portions of the excavated bedrock surface could not be visually observed. Rather, bedrock observations in this subunit will be made during cleanup of the Man Camp area. In addition, bedrock was not observed beneath known trash pit locations in CSZBR-02, and CSZBR-03. Verification of bedrock beneath these trash pits will be made upon final cleanup (i.e., removal of the trash) during planned demolition activities.

Although all parties were in agreement that bedrock had been reached throughout the Northern CSZ, further verification of rock conditions in each subunit CSZBR-01, CSZBR-02, CSZBR-03, and CSZBR-04, was performed using excavator bucket refusal as discussed, via email correspondence, by Mr. Lou Miller (Supervising Contractor) and Ms. Karen Keely (US EPA Project Manager) on November 7th 2016. The following number of excavator bucket refusal tests were performed in each subunit:

- CSZBR-01; three excavator bucket refusal tests
- CSZBR-02; three excavator bucket refusal tests
- CSZBR-03; five excavator bucket refusal tests
- CSZBR-04; four excavator bucket refusal tests

Excavator bucket refusal tests were performed using a Komatsu PC-228 excavator. This excavator is similar in size and horsepower rating to a Caterpillar Model 320 excavator. The locations of the excavator bucket tests are shown on Figure 1. At each location the teeth of the excavator bucket penetrated from less than one to three inches before the tracks were lifted off the ground. A photograph of each bucket test is provided at the end of this document. Based on observations during this inspection, excavator performance

during previous routine On-going CQA inspections during soil cleanup activities, and the results of excavator bucket refusal tests, all parties concurred that bedrock was encountered at the Northern CSZ in subunits CSZBR-01, CSZBR-02, CSZBR-03, and CSZBR-04 as described above.

### Acceptance by Key Personnel

The following personnel observed exposed bedrock and the associated excavator bucket tests at the Northern CSZ in subunits CSZBR-01, CSZBR-02, CSZBR-03, and CSZBR-04, and concur that bedrock has been reached in these areas.



Chamil Baigildin, Newmont/DMC Construction Manager



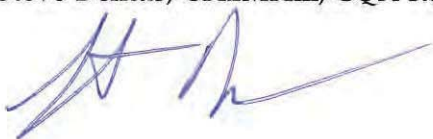
Terrence Price, MWH CQA Supervisor

Matt Scott for

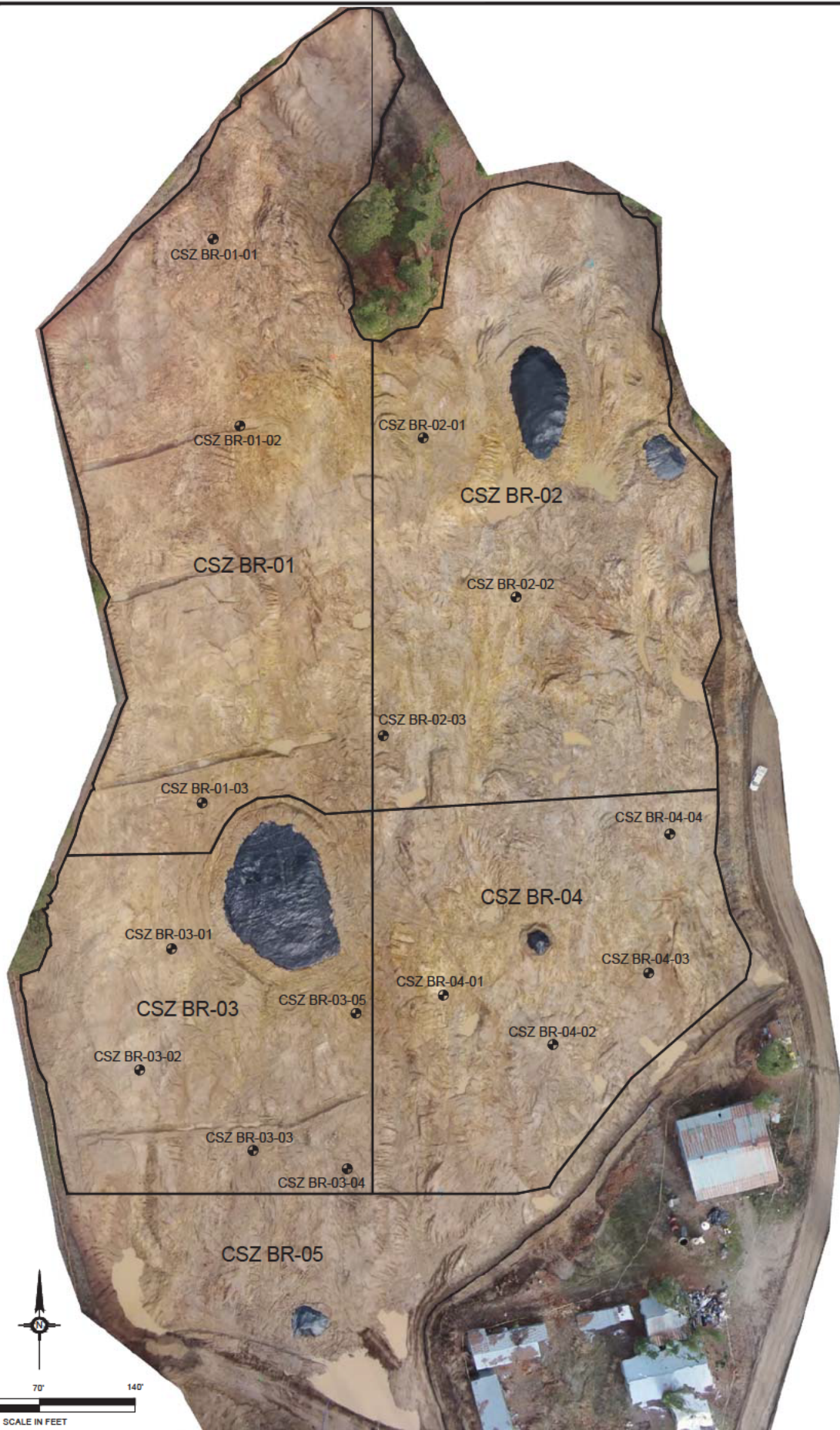
~~Kelley Finely~~, Envirocon Construction Superintendent



Steve Demus, CH2MHill, CQA Representative for the USEPA







**NOTES:**

- 1) Image Date: 11/07/2016.
- 2) Coordinates: Project Coordinates: NAD 83, WA State Plane North Zone (Ground), NAVD 88 (CONUS 2012B Geoid).
- 3) Tests conducted on 11/09/2016.

Prepared By:



**Envirocon**

7878 Wadsworth Blvd  
Suite 340  
Arvada, CO 80003

DES MWH

DWG GGE

CHK EI

PROJECT #: 1408002

CSZ Quartz Monzonite  
Bedrock Refusal Test  
Locations

11-11-2016

Figure 1



## Photographs



Figure 1 – Refusal test at CSZBR-01-1



Figure 2 – Refusal test at CSZBR-01-2



Figure 3 – Refusal test at CSZBR-01-3



Figure 4 – Refusal test at CSZBR-02-1



Figure 5 – Refusal test at CSZBR-02-2



Figure 6 – Refusal test at CSZBR-02-3





Figure 7 – Refusal test at CSZBR-03-1



Figure 8 – Refusal test at CSZBR-03-2



Figure 9 – Refusal test at CSZBR-03-3



Figure 10 – Refusal test at CSZBR-03-4



Figure 11 – Refusal test at CSZBR-03-5



Figure 12 – Refusal test at CSZBR-04-1



Figure 13 – Refusal test at CSZBR-04-2



Figure 14 – Refusal test at CSZBR-04-3



Figure 15 – Refusal test at CSZBR-04-4

## **Attachment 2**

### **Documentation/Verification of Competent Bedrock (Phase 2)**

---

(Mancamp, Trash Pits and Remaining Soil Excavation Areas)

## Observation and Acceptance of Bedrock Refusal

PREPARED FOR: Dawn Mining Company  
PREPARED BY: Jed Thompson (Stantec CQO)  
INSPECTION DATE: 07/19/2017  
REPORT DATE: 07/25/2017  
AREA NUMBER: Northern Construction Support Zone

### Purpose

This memorandum documents observation and stakeholder acceptance of bedrock refusal during a Site inspection of the Northern Construction Support Zone (CSZ) on July 19, 2017. This observation and acceptance was performed following the recommendations provided in the *Analytical Support and Verification Plan for Remediation of Surface Materials and Sediments*, Appendix S of the *Midnite Mine Remedial Action Work Plan (RAWP)*. Specifically, Attachment S-3 of Appendix S of the RAWP states that:

1. During soil cleanup at the Site, the occurrence of bedrock is determined by direct observation of the excavation in progress. It is the responsibility of the Remedial Action (RA) Construction Contractor to notify the supervising Engineer and obtain concurrence that bedrock has been reached prior to terminating soil cleanup excavations.
2. In the event a disagreement occurs between the stakeholders (Contractor, Owner, Engineer, Agencies, etc.) over whether bedrock has been reached at a specific location, that observation of field performance of the specified excavation equipment be used to determine the occurrence of bedrock. Specifically, it is recommended that in the event of a dispute over whether bedrock has been reached, direct observation of excavator “bucket refusal” will be taken as an indication that bedrock has been reached, and the excavation will be terminated. The point of “bucket refusal” will be defined as the depth where the teeth on the bucket (Caterpillar K-Series Extra Duty Teeth on a 30-inch wide bucket) of a track-mounted Caterpillar 320 or similar hydraulic excavator cannot fully penetrate into the formation when the leading end (closest to the bucket) of the tracks have been lifted off the ground. “Bucket refusal” on boulders will not be taken as an indication that bedrock has been reached.



## **Bedrock Exposure Delineation/Staking Data**

Delineation of the boundary of bedrock exposed by excavation in the Northern CSZ is shown of Figure 1. Portions of the Northern CSZ were previously verified as having been excavated to bedrock as document in the Special Inspection Report dated 11/09/2016. This inspection included the Trash and PCS piles and well head that were excluded from the previous bedrock verification and areas south of the 11/09/2016 verification boundary, including the former Man Camp Area.

## **Stakeholder Observations of Bedrock**

Observation of bedrock encountered at the Northern CSZ was performed by Mr. Greg Zoeller (ACOE, CQA representative for the USEPA), Mr. Jed Thompson (Stantec CQAO), Mr. Justin Moyer (Envirocon CQC Manager), and Mr. Kelly Finley (Envirocon Construction Superintendent).

Based on observations made during this inspection and during previous observations of excavation progress during routine On-going CQA inspections, all parties were in general agreement that bedrock had been reached within all areas being verified.

Although all parties were in agreement that bedrock had been reached throughout the Northern CSZ, further verification of rock conditions was performed using excavator bucket refusal.

Excavator bucket refusal tests were performed using a Komatsu PC-228 excavator. This excavator is similar in size and horsepower rating to a Caterpillar Model 320 excavator. The locations of the excavator bucket tests are shown on Figure 1. At each location, the teeth of the excavator bucket penetrated from approximately one to six inches before the tracks were lifted off the ground. A photograph of each bucket test is provided at the end of this document. Based on observations during this inspection, excavator performance during previous soil cleanup activities, and the results of excavator bucket refusal tests, all parties concurred that bedrock was exposed throughout the inspection areas.

## **Acceptance by Key Personnel**

The following personnel observed exposed bedrock and the associated excavator bucket tests at the Northern CSZ within the areas described above and concur that bedrock has been reached in these areas.



Jed Thompson, Stantec CQAO



Kelly Finely, Envirocon Construction Superintendent



07/26/2017

Justin Moyer, Envirocon CQC Manager

Greg Zoeller, ACOE, CQA Representative for the USEPA

## Thompson, Jed

---

**From:** Zoeller, Gregory T (Greg) CIV USARMY CENWS (US) <Gregory.T.Zoeller@usace.army.mil>  
**Sent:** Wednesday, July 26, 2017 1:45 PM  
**To:** Thompson, Jed  
**Subject:** RE: Bedrock Verification Signoff (UNCLASSIFIED)  
**Attachments:** 2017 NCSZ Bedrock Accpetance\_v0 (002).pdf

CLASSIFICATION: UNCLASSIFIED

Jed,

PDF version signed. If you cannot use this electronic signature, this email will verify I agree with the acceptance of the bedrock confirmation.

Thanks,

Greg Zoeller  
QA Representative  
Albeni Falls Dam  
Phone: (208) 437-3133 EXT 246  
Cell [REDACTED]

-----Original Message-----

From: Thompson, Jed [mailto:Jed.Thompson@stantec.com]  
Sent: Wednesday, July 26, 2017 10:57 AM  
To: Zoeller, Gregory T (Greg) CIV USARMY CENWS (US) <Gregory.T.Zoeller@usace.army.mil>; Kelly Finley <kfinley@envirocon.com>; Justin Moyer <jmoyer@envirocon.com>  
Cc: Logan, Jeffrey <Jeff.Logan@stantec.com>; Tom Zimmer (thomas.zimmer@riotinto.com) <thomas.zimmer@riotinto.com>; Clem Hartery <Clem.Hartery@Newmont.com>  
Subject: [Non-DoD Source] Bedrock Verification Signoff

Greg, Kelly, Justin, if you're in agreement with the attached, please sign the signature page of the attached Word document and return to me.

Greg, an email similar to what you sent Terry and Tom for the WAR bedrock verification will work as well.

Thanks,

Jed Thompson

Senior Environmental Engineer

Stantec  
Cell: [REDACTED]  
jed.thompson@stantec.com



The content of this email is the confidential property of Stantec and should not be copied, modified, retransmitted, or used for any purpose except with Stantec's written authorization. If you are not the intended recipient, please delete all copies and notify us immediately.

\* Please consider the environment before printing this email.

CLASSIFICATION: UNCLASSIFIED

## Photographs



Figure 1 - CSZ BR-05-01



Figure 2 - CSZ BR-05-02



Figure 3 - CSZ BR-05-03



Figure 4 - CSZ BR-05-04



Figure 5 - CSZ BR-05-05



**LEGEND**

CONTOUR MAJOR (10')

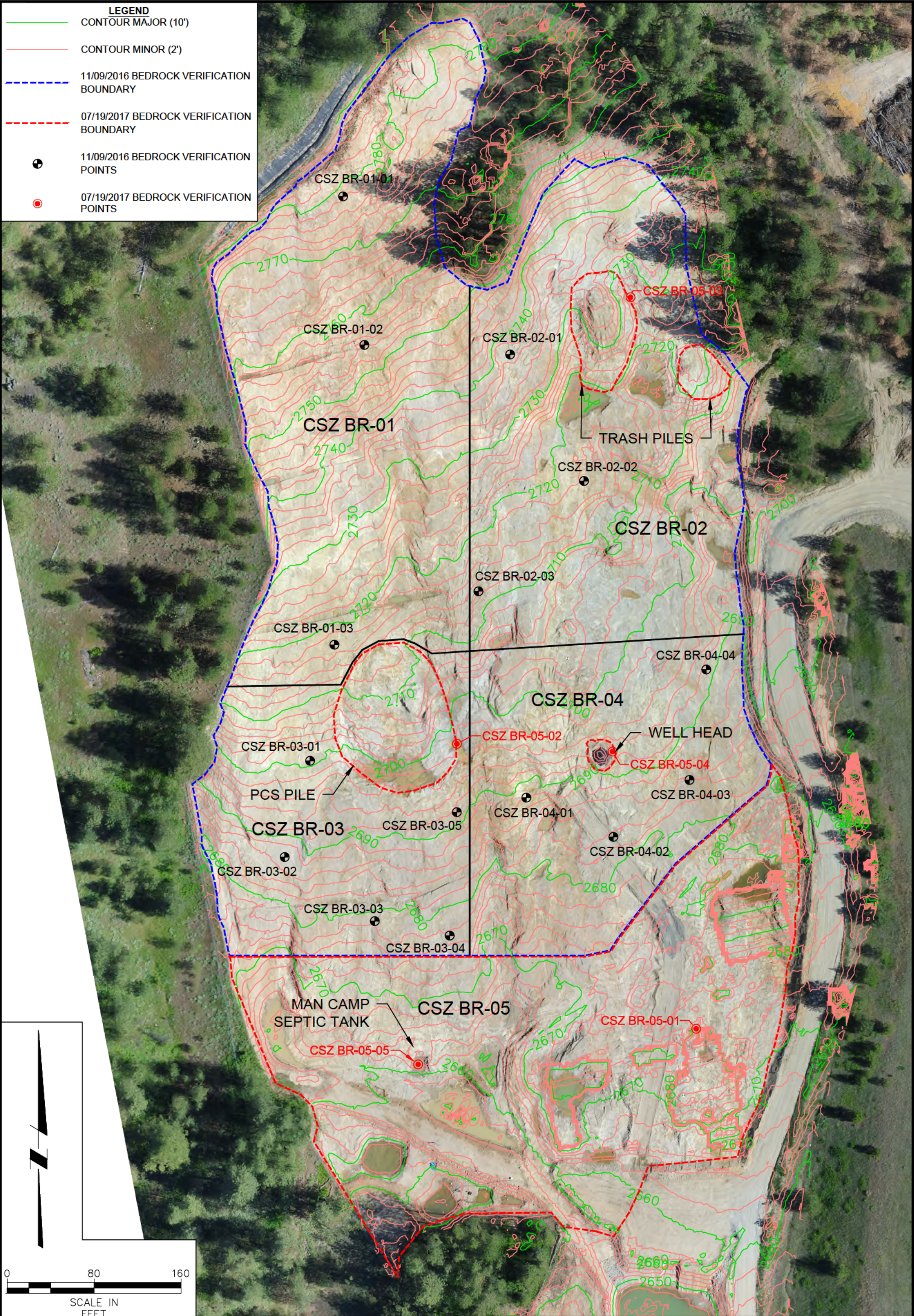
CONTOUR MINOR (2')

11/09/2016 BEDROCK VERIFICATION BOUNDARY

07/19/2017 BEDROCK VERIFICATION BOUNDARY

11/09/2016 BEDROCK VERIFICATION POINTS

07/19/2017 BEDROCK VERIFICATION POINTS



SCALE IN FEET

**NOTES:**  
1) AERIAL IMAGERY DATED 6/22/2017 AND CONTOUR DATED 4/19/2017 PROVIDED BY ENVIROCON



PROJECT LOCATION	SPOKANE, WASHINGTON
PROJECT	MIDNITE MINE
TITLE	P1-Z1-2A BEDROCK VERIFICATION AREAS

SHEET	1	REVISION	0
FILE NAME	CSZ Bedrock Delineation Areas.dwg		
DATE	JULY 2017		



## **Attachment 3**

### **Field Logbook Notes**

---

Field Notes documented by Aaron Orechwa, Tetra Tech. One Wynsor field staff assisted with gamma survey. Signature of sampling personnel are shown in the logbook notes. Page 1:

Wednesday, July 19, 2017 114-121850

LEFT HOTEL 0530 Sunny 90°, dry

ARRIVE TO MIDNITE MINE @ 0700

0700 MEET w/NEWMAAT; CIEM

SIGN IN 0730 at ENVIAOCEN TRAILER

\* MET w/ WYNSOR RADIATION TECHNICIANS TO

DISCUSS QUALITY CONTROL REQUIREMENTS

REGARDING NORTHERN CONSTRUCTION ZONE SUPPORT AREA

0800 INITIATE QC CALIBRATION CHECKS

FOLLOWING FSS WORK PLAN, SOP 6; APP 50.

INSTRUMENT #1		S/N:	
H2S TRAILER		17: MFG 12	
#	BG	CS-137	FS
1	35.2	97.4	28.4
2	37.8	97.6	27.7
3	38.2	99.5	28.4
4	34.7	97.1	29.6
5	35.1	100.1	27.5
6	35.3	101.6	29.3
7	36.1	100.7	28.2
8	34.0	102.7	30.3
9	35.0	102.7	30.2
10	37.1	101.4	31.5

END OF ENTRIES FOR PAGE

Aaron Orechwa

Kennedy

Field Notes documented by Aaron Orechwa, Tetra Tech. One Wynsor field staff assisted with gamma survey. Signature of sampling personnel are shown in the logbook notes. Page 2/3:

WEDNESDAY, July 19, 2017 114-191750				WEDNESDAY, July 19, 2017 114-191810			
INSTRUMENT 2		S/N		INSTRUMENT 3 (WYNJOR 44-10/2350-1)		S/N	
H&S TRAINING		10: MPG 15		H&S TRAINING		10: JEW	
PS				PS @ SOILS LAB		S/N: 325219	
#	RG	CG-137	PS	#	RG	CG-137	PS
1	35.1	103.8	26.2	1	33.5	99.1	26.6
2	33.3	103.3	28.3	2	34.1	96.1	25.4
3	34.4	104.9	27.0	3	33.9	96.8	26.8
4	36.6	106.9	27.6	4	34.5	101.2	28.1
5	37.8	103.3	29.0	5	34.7	100.9	25.7
6	35.3	102.1	28.7	6	35.0	98.2	25.3
7	38.0	105.3	28.2	7	33.3	99.8	25.8
8	36.3	107.6	30.2	8	34.5	100.3	29.1
9	37.8	106.8	28.6	9	34.8	97.9	28.0
10	36.9	106.1	27.7	10	34.3	98.2	28.2
FIELD STRIP LOCATED AT (FORMER) SOILS LAB							
GPS COLOCATED							
END OF FIELD ENTRIES				END OF FIELD ENTRIES			
FOR PAGE				FOR PAGE			
↓				↓			
Aaron Orechwa				Aaron Orechwa			
Kevin Munn				Kevin Munn			

Field Notes documented by Aaron Orehwa, Tetra Tech. One Wynsor field staff assisted with gamma survey. Signature of sampling personnel are shown in the logbook notes. Page 4/5:

THURSDAY, JULY 20, 2017 114-181822

ARRIVE MIDNITE @ 0700 Sunny 83°F

\* Met w/ Bill Lyle to discuss plans, decisions  
TO FINISH SCAN @ MIDNITE

ARRIVE MIDNITE MINE 0745; CHECK IN

0745 Met w/ Ted Statler to discuss  
SCAN BOUNDARY FOR CSZ. CONTAMINANT  
BINARY IS OPEN TO FS

0 UPLINKED FILLIN GAPS TO GPS

0 CHANGED BATTERIES ON 2350-1/44-10

Voltage check ✓

MFG 12 6.3v

MFG 15 6.4v

ID	BG	CS-137	FS
MFG 12	35.9	100	28.8
MFG 15	35.7	105	28.8

LEFT H&S BUILDING @ 1015 TO GO  
TO DESIGNATED FIELD STRIP

END OF ENTRY  
PER PAGE

THURSDAY, JULY 20, 2017 114-181810

ARRIVE @ CSZ 1045 TO INITIATE  
FINAL STATUS GAMMA RADIATION SURVEY

SURVEYORS: Aaron Orehwa (TT)  
Kevin Murray (Wynsor)

SURVEY OBJECTIVES:

- COMPLETE 3M SCAN LINES
- FILLIN GAPS W DIFFICULT

TERRAIN

ANTONIO ARRIVED @ 1200

FINISHED SCAN AT 1320; HEADED TO FIELD STRIP

ARRIVE H&S TRAILER @ 1325

ID	BG	CS-137	FS
MFG 12	35.2	99.4	27.8
MFG 15	34.9	103	30.1

\* Met w/ Bill; evaluated data; need  
to collect more data

END OF FIELD  
ENTRY  
PER PAGE



Field Notes documented by Aaron Orechwa, Tetra Tech. One Wynsor field staff assisted with gamma survey. Signature of sampling personnel are shown in the logbook notes. Page 6:

THURSDAY, JULY 20, 2017 114-181850

RETURN TO CSZ @ 1545

UTILIZE ONLY DETECTOR MFG-12

SUPERVISOR: A. ORECHWA

OBJECTIVE: FINAL FILLIN SCAN

COMPLETE SCAN AT 1700 (10.5 miles)

FIELD STOP 1700

RETURN TO TRAILER 1715

QC ON DETECTOR USED IN PAST 15 (PM)

ID	BG	CS-13J	FS
MFG 12	35.0	102	27.6

FINAL SHADE/DATA FIGURES (17A) FOR 7/19/17 TO 7/20/17

7/19 MFG 12 - 072417 - AM MFG 15 - 071917 - AM  
MFG 12 - 071917 - PM MFG 15 - 071917 - PM  
MFG 12 - 071917 - PM EX

7/20 MFG 12 - 072017 - AM MFG 15 - 072017 - AM  
MFG 12 - 072017 - PM

LEFT SITE @ 1735

RETURN TO HOTEL 1835

END OF FIELD NOTES  
FOR 7/20/17



## **Attachment 4**

### **Calibration Certificates for Gamma Survey Instruments**

---



Designer and Manufacturer  
of  
Scientific and Industrial  
Instruments

# CERTIFICATE OF CALIBRATION

MFG-12

LUDLUM MEASUREMENTS, INC.

501 Oak Street  
325-235-5494  
Sweetwater, TX 79556, U.S.A.



Customer TETRA TECH MFG, INC. ORDER NO. 20308451/447974  
Mfg. Ludlum Measurements, Inc. Model 2350-1 Serial No. 134764  
Cal. Date 31-Mar-17 Cal Due Date 31-Mar-18 Cal. Interval 1 Year Meterface N/A  
Check mark ☒ applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 48 % Alt 699.0 mm Hg  
☐ New Instrument ☐ Instrument Received ☒ Within Toler. ☐ +10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments  
☒ Mechanical check ☒ F/S Resp. check ☒ Audio check ☒ Ratemeter Linearity check ☒ Data Log check  
☒ Reset check ☒ Alarm Setting check ☒ Integrated Dose check ☒ Overload check  
☒ Window Operation ☒ Battery check ☒ Recycle Mode check ☒ Scaler Readout check  
☒ Input Sens. Linearity  
Threshold Dial Ratio 100 = 10 mV  
☒ Calibrated in accordance with LMI SOP 14.8 ☐ Calibrated in accordance with LMI SOP 14.9  
☒ HV Readout (2 points) Ref./Inst. 500 / 500 V Ref./Inst. 2000 / 1999 V

COMMENTS: Firmware: 37122N21  
I/O Firmware: 37123n05 ; Cal'd w/39" cable ; Resolution for Cs137: 9.66%

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.						
Detector #	Probe Model	Serial #	High Voltage	Threshold	Units/Time Base	Dead Time Correction Factor
Detector # 1	LMI44-10	PR139484	900	100	4 / 2	1.382029E-05
Detector # 2	LMI44-10	PR139484	900	100	7 / 1	1.382029E-05
Detector # 3	CS137PK	662KEV	598	642	7 / 1	0.000000E+00
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						
Detector #						

Units: 0 -- rad, 1 -- Gray, 2 -- rem, 3 -- Sv, 4 -- R, 5 -- C/Kg, 6 -- Disintegrations, -- Counts, 8 -- C/cm sq., 9 -- Bq/cm sq.  
Time Base: 0 -- Seconds, 1 -- Minutes, 2 -- Hours \* See attached detector documentation, if applicable

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout	400kcpm	39974(6)	400kcpm	40(6)	40(6)
	40kcpm	3998	40kcpm	4	4
	4kcpm	400			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other international Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCCL Z540-1-1994 and ANSI N323-1978 ISO/IE 17025:2005(E) State of Texas Calibration License No. LO-1953

Reference Instruments and/or Sources: Cs-137 S/N: ☐ 059 ☐ 2171CP ☐ 2261CP ☐ 720 ☐ 734 ☐ 781 ☐ 1131 ☐ 1516 ☐ 1698 ☐ 1909 ☐ 1916CP ☐ 2324/2521  
☐ 5717CO ☐ 5719CO ☐ 60645 ☐ 70897 ☐ 73410 ☐ E552 ☐ G112 ☒ 2168CP ☐ S-304 ☐ S-1054 ☐ T10051 ☐ T10082 Neutron Am-241 Be ☐ T-304 Ra-226 ☐ Ys82

☐ Alpha S/N ☐ Beta S/N ☐ Other ☒ m 500 S/N 190566 ☐ Ra-226 S/N Y982 ☒ Multimeter S/N 86250390

Calibrator Jason Flores Title Calibrator Date 31-Mar-17  
QC'd By Jason Flores Title Service Dept. QC Date 31-Mar-17



Designer and Manufacturer  
of  
Scientific and Industrial  
Instruments

# LUDLUM MEASUREMENTS, INC.

501 Oak Street  
325-235-5484  
Sweetwater, TX 79556, U.S.A.



## Model 2350 Bench Test Data

Customer TETRA TECH MFG, INC. ORDER NO. 20308451/447974

Model 2350-1 Serial No. 134764 Detector 44-10 Serial No. PR139484

Source CS 137, YmLi

High Voltage 900 V As Found 900 V. Input 10.0000 mV As Found 10 mV.

Cal. Constant 5.535037E+10 as found 5.535037E+10

Dead Time 1.382029E-05 as found 1.382029E-05

Alarm Setting: Ratemeter 100000000.000000 as found 1.0E+09

Scaler 1000000.000000 as found 1.0E+06

Integrated dose 100000000.0000 as found 1.0E+09

Overload ☐ On ☒ Off as found ☐ On ☒ Off Window 1000 as found 1000

Detector Received: ☒ Within Toler.  $\pm 10\%$  ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

Reference Point	"As Found" Readings: Meter Reading	After Adjustment Readings: Meter Reading
<u>2000 mR/h</u>	<u>1.92 mR/h</u>	<u>1.92 mR/h</u>
<u>1500</u>	<u>1.50</u>	<u>1.50</u>
<u>1000</u>	<u>1.00</u>	<u>1.00</u>
<u>500</u>	<u>498 mR/h</u>	<u>498 mR/h</u>
<u>200</u>	<u>198</u>	<u>198</u>
<u>100</u>	<u>101</u>	<u>101</u>

ISO/IE 17025:2005(E)

Other \_\_\_\_\_

Signature Jason Flores Date 31-MAR-17





Designer and Manufacturer  
of  
Scientific and Industrial  
Instruments

# CERTIFICATE OF CALIBRATION

*MPG-15*

**LUDLUM MEASUREMENTS, INC.**

501 Oak Street  
325-235-5494  
Sweetwater, TX 79556, U.S.A.



CERT # 4084.01

Customer TETRA TECH MFG, INC. ORDER NO. 20308451/447974

Mfg. Ludlum Measurements, Inc. Model 2350-1 Serial No. 134768

Cal. Date 31-Mar-17 Cal Due Date 31-Mar-18 Cal. Interval 1 Year Meterface N/A

Check mark ☒ Applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 48 % Alt 699.0 mm Hg

☐ New Instrument ☐ Instrument Received ☒ Within Toler.  $\pm 10\%$  ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☒ Mechanical check ☒ Reset check ☒ Window Operation ☒ Input Sens. Linearity

☒ F/S Resp. check ☒ Alarm Setting check ☐ Battery check

☒ Audio check ☒ Integrated Dose check ☒ Recycle Mode check

☒ Ratemeter Linearity check ☒ Overload check ☒ Scaler Readout check

☒ Data Log check

☐ Calibrated in accordance with LMI SOP 14.8 ☒ Calibrated in accordance with LMI SOP 14.9

☒ HV Readout (2 points) Ref./Inst. 500 / 301 V Ref./Inst. 2000 / 2000 V

Threshold Dial Ratio 100 = 10 mV

**COMMENTS:** Firmware: 37122N21  
I/O Firmware: 37123n05 ; Cal'd w/39" cable ; Resolution for Cs137: 10.87%

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

Probe Model	Serial #	High Voltage	Threshold	Units/ Time Base	Dead Time Correction Factor	Calibration Constant	Linearity $\pm 10\%$
Detector # 1 LMI44-10	PR139491	1050	100	4 / 2	1.293934E-05	5.310904E+10	<input checked="" type="checkbox"/>
Detector # 2 LMI44-10	PR139491	1050	100	7 / 1	1.293933E-05	1.000000E+00	
Detector # 3 CS137	662KEV	760	642	7 / 1	0.000000E+00	1.000000E+00	
Detector #							
Detector #							
Detector #							
Detector #							
Detector #							
Detector #							
Detector #							
Detector #							
Detector #							
Detector #							
Detector #							
Detector #							
Detector #							
Detector #							

Units: 0 -- rad, 1 -- Gray, 2 -- rem, 3 -- Sv, 4 -- R, 5 -- Ci/Kg, 6 -- Disintegrations, -- Counts, 8 -- Ci/cm sq., 9 -- Bq/cm sq.  
Time Base: 0 -- Seconds, 1 -- Minutes, 2 -- Hours

\* See attached detector documentation, if applicable

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout 400kcpm	<u>39964(0)</u>	<u>39964(0)</u>	400cpm	<u>40(0)</u>	<u>40(0)</u>
40kcpm	<u>3997</u>	<u>3997</u>	40cpm	<u>4</u>	<u>4</u>
4kcpm	<u>400</u>	<u>400</u>			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/ISO 17025-1:2005 and ANSI N323-1978 (ISO/IE 17025:2005(E)) State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: Cs-137 S/N ☐ 059 ☐ 2171CP ☐ 2261CP ☐ 720 ☐ 734 ☐ 781 ☐ 1131 ☐ 1618 ☐ 1696 ☐ 1909 ☐ 1915CP ☐ 2324/2521

☐ 5717CO ☐ 5719CO ☐ 60548 ☐ 70897 ☐ 73410 ☐ E552 ☐ G112 ☒ 2159CP ☐ S-394 ☐ S-1054 ☐ T10081 ☐ T10082 Neutron Am-241 Be ☐ T-304 Ra-226 ☐ Y982

☐ Alpha S/N ☐ Beta S/N ☐ Other

☒ m 500 S/N 190566 ☐ Ra-226 S/N Y982 ☒ Multimeter S/N 86250390

Calibrator Jason Flores Title Calibrator Date 31-MAR-17

QC'd By [Signature] Title Service Dept. QC Date 31 Mar 17





Designer and Manufacturer  
of  
Scientific and Industrial  
Instruments

# LUDLUM MEASUREMENTS, INC.

501 Oak Street  
325-235-5494  
Sweetwater, TX 79556, U.S.A.



CERT # 4084.01

## Model 2350 Bench Test Data

Customer TETRA TECH MFG, INC. ORDER NO. 20308451/447974

Model 2350-1 Serial No. 134768 Detector 44-10 Serial No. PR139491

Source CS137, 4.6i

High Voltage 1050 V As Found 1050 V. Input 10,0000 mV As Found 10 mV.

Cal. Constant 5.310904E+10 as found 5.310904E+10

Dead Time 1.293934E-05 as found 1.293934E-05

Alarm Setting: Ratemeter 1000000000.000000 as found 1.0E+09

Scaler 1000000.000000 as found 1.0E+06

Integrated dose 1000000000.0000 as found 1.0E+09

Overload ☐ On ☒ Off as found ☐ On ☒ Off Window 1000 as found 1000

Detector Received: ☒ Within Toler.  $\pm 10\%$  ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

Reference Point	"As Found" Readings: Meter Reading	After Adjustment Readings: Meter Reading
<u>2000 R/A</u>	<u>1.87 mR/h</u>	<u>1.87 mR/h</u>
<u>1500</u>	<u>1.47</u>	<u>1.47</u>
<u>1000</u>	<u>1.00</u>	<u>1.00</u>
<u>500</u>	<u>504 R/A</u>	<u>504 R/A</u>
<u>200</u>	<u>202</u>	<u>202</u>
<u>100</u>	<u>102</u>	<u>102</u>

ISO/IE 17025:2005(E)

Other \_\_\_\_\_

Signature Jason Flores Date 21-MAR-17

### Bench Test Data For Detector

Detector 44-10 Serial No. PR139491

Customer TETRA TECH MFG. INC.

ORDER NO. 20308451/447974

Counter 2350-1 Serial No. 134768 Counter Input Sensitivity 10 mV

Count Time 10 sec. Distance Source to Detector Surface

Other CC: 1.0E+06 DT: 1.293933E-05

[illegible]

Signature Jason Flores

Date 31-Mar-17